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MODELING MIXED LAYER FLOW UNDER MULTIPLE LEADS IN SEA ICE

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OBJECTIVES

The objectives of this study are to obtain a better understanding of convectively driven mixed layer ocean circulations under multiple leads in sea ice. This improved understanding will lead to better air-sea heat flux parameterizations in ice covered regions for larger scale Arctic climate models.

APPROACH

During the previous several years of support, a nonhydrostatic high resolution convection model has been developed for the study of ocean flow beneath leads in sea ice. The results obtained thus far have been for two dimensional flow fields. Recently however, the model has been adapted to three dimensions.

This three dimensional, nonhydrostatic convection model will be used to study convective circulation under multiple leads. A series of high resolution experiments in which the fraction of open water is varied among the number of leads will be used to determine the interrelationships between open water fraction, mixed layer temperature and ice thickness. The existing ocean model will be coupled to ice growth models for frazil and congelation ice types. The sensitivity of the model results to lead width, air-sea temperature and wind speed will be examined. The experiments will contribute to an understanding of the near surface radiation budget in the Arctic Ocean and aid in the design of parameterizations of these processes for the inclusion in larger scale general circulation and climate models.

ACCOMPLISHMENTS

This project initiated during the last month of FY97 has only just begun. A paper documenting the nonhydrostatic ocean flow associated with individual stationary and moving leads was accepted for publication during FY97.

RELATED PROJECTS

None

PUBLICATIONS

1997, Smith, D. C., IV and J. H. Morison: Nonhydrostatic effects in haline convection beneath leads in sea ice, J. Geophys. Res. (in press).